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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/421,781	10/19/1999	JUENG GIL LEE	CDST-C130	4608

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EXAMINER

ROY, SIKHA

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 09/12/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/421,781

Applicant(s)

LEE ET AL.

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 June 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20,54-60 and 67-69 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 October 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7,10.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

The Amendment, filed on June 11, 2002 has been entered and is acknowledged by the Examiner.

Cancellation of claims 9,21-53 and 61-66 has been entered.

Claim Objections

Claim10 is objected to because of the following informality.

In claim 10 line 1 'as recited in claim 9' should be replaced by --as recited in claim 1--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 54 and 55 are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent 6,064,149 to Raina.

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Regarding claim 54 Raina discloses (Fig. 2 and 4 column 5 lines 60-67, column 6 lines 25-40 column 8 lines 22-41) an electrode (cathode) structure for a field emission display device comprising a plurality of first electrodes 34, a resistor layer 36 disposed over the first electrodes, a dielectric layer 40 disposed over the resistor layer, plurality of second electrodes 44 disposed over the dielectric layer and a passivation layer 56 disposed over the second electrodes.

Referring to claim 55 Raina discloses (column 8 lines 38-40) the passivation layer consisting of silicon nitride.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3,10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 5,894,188 to Chakvorty et al.

Regarding claims 1 and 20, Shen et al. disclose (column 3 lines 40-67) a field emission display comprising first conductive electrodes 20 formed on an insulating substrate 30, a resistive layer 40 overlying first electrodes 20, a dielectric layer 70, second conductive electrodes 60 having plurality of apertures formed on the dielectric

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layer. At least one of the first and second conductive electrodes (layers) is formed of metal alloy comprising titanium tungsten (TiW) and aluminum. Shen et al. further disclose (column 4 lines 14-16,28,29) the conductive electrode (conductor 20) comprising of sublayers 20a comprising titanium tungsten and 20b comprising aluminum only.

Claim 1 differs from Shen et al. in that Shen et al. do not exemplify the first electrodes comprising a cladding layer disposed over the metal alloy.

Chakvorty et al. in analogous art of metal for flat panel display disclose (Column 5 lines 60,61 Fig. 1C) a cladding layer 104 deposited on the electrode 103. Chakvorty et al. further disclose (column 8 lines 19-26) that the refractory metals molybdenum and tungsten which are easy to process and make good electrical contact with aluminum conductors are used as cladding layer so as to seal each aluminum strip forming row or column metal strips.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add to the first electrodes of Shen et al. cladding layer as suggested by Chakvorty for sealing each electrode.

Referring to claims 2 and 3, Shen et al. disclose (column 3 lines 60-67) the second electrodes 60 are arranged as rows of conductive bands across the surface of the substrate and the first electrodes 20 are arranged as columns of conductive bands across the substrate 30 substantially orthogonal to the second electrodes thereby permitting matrix-addressed selection of microtips 50 at the intersection of a row and a

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column corresponding to a pixel. The two sets of electrodes being orthogonal to each other, the first set of electrodes can be arranged as rows and the second set of electrodes arranged as columns.

Referring to claim 10 Chakvorty et al. disclose (column 8 lines 19-26) the cladding layer comprising molybdenum and tungsten disposed over the first electrode.

Claims 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. and U. S. Patent 5,894,188 to Chakvorty et al. in view of U. S. Patent 6,320,138 to Kamiya et al.

Claims 4-8 differ from Shen et al. and Chakvorty et al. in that Shen et al. and Chakvorty do not exemplify the metal alloy of the electrodes made of aluminum alloy comprising .5 to 6 atomic percent neodymium and up to 5 atomic percent titanium.

Referring to claims 4- 8, Kamiya in relevant art conductor formed of low-resistance aluminum alloy discloses (column 5 lines 5,6) Al-Nd-Ti alloy thin film formed with the substrate. It is noted that the occurrence of any hillock and pinhole in the thin film conductor can be suppressed by setting the concentrations of neodymium and titanium. Kamiya discloses (column 7 lines 10-16) the conductor made of an aluminum alloy consisting essentially of aluminum, neodymium and titanium setting the concentration of neodymium and titanium from at least about 0.1 atomic % to 3.5 atomic %.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the alloy of the conducting electrodes of Shen et al. and

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Chakvorty by aluminum alloy comprising neodymium and titanium as taught by Kamiya for suppressing the hillock and pinhole occurrences in the thin film conductor.

Claims 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. and U. S. Patent 5,894,188 to Chakvorty et al. in view of U. S. Patent 6,265,822 to Kuroda et al.

Regarding claims 11,12,14,16, Shen et al. and Chakvorty et al. do not exemplify the metal alloy comprising silver alloy having palladium, copper and titanium.

Kuroda et al. in relevant art of electron beam apparatus disclose (column 15 lines 61-67) cold cathode elements disposed in matrix pattern and the conductive material used for electrodes selected from metals such as Mo, W, Ti, Cu, Pd and Ag and alloys of these metals. It is further noted these metals and their alloys can be formed easily in the form of a fine particle film having excellent electron emission characteristics and can be manufactured easily (column 15 lines 22-25). The lower the content of the transition metal (copper, palladium) the lower becomes the thin film resistance when the electrode serve as a wiring conductive layer.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the metal alloy of the electrodes of Shen et al. and Chakvorty by silver alloy comprising palladium, copper and titanium as disclosed by Kuroda et al. for forming the electrodes easily by vapor deposition in the form of thin film with excellent emission characteristics.

Regarding claims 13,15 and 17 Shen et al. and Chakvorty in view of Kuroda et al. disclose the claimed invention except for the limitation of range of

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concentration of palladium, copper and titanium from .5 to 2 atomic percent. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide range of concentration from .5 to 2 atomic percent, since optimization of workable ranges is considered within the skill of the art.

Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being -unpatentable over U. S. Patent 5,594,297 to Shen et al. and U. S. Patent 5,894,188 to Chakvorty et al. in view of U. S. Patent 6,064,149 to Raina.

Regarding claims 18,19, Shen et al. and Chakvorty do not disclose a passivation layer comprising silicon nitride disposed over the plurality of second electrodes.

Raina in analogous art of field emission device discloses (column 8 lines38-42 Fig.4) a passivation layer 56 consisting of silicon nitride formed over the gate metal layer. It is to be noted that this passivation layer protects the entire set of layers underneath.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add a passivation layer of silicon nitride as taught by Raina disposed over the second electrodes of Shen et al. and Chakvorty to protect the conductive second electrodes and dielectric layer underneath.

Claims 56-58, 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,064,149 to Raina in view of WO 98/43268 to Amey.

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Regarding claims 56-58, Raina does not disclose a gate structure disposed over the passivation layer of silicon nitride or between the second electrodes and passivation layer or between the second electrodes and the dielectric layer.

Amey in pertinent art of field emitter cathode backplate structures discloses (page 7 lines 8-12 fig. 3(a)) a gate structure (electrical conductor 17) formed over a dielectric layer 15 for serving as additional control or focusing the electrons.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to add a gate structure as taught by Amey on the passivation layer of Raina for additional control or focusing the electron from the emitter.

Regarding claims 57,58 Raina and Amey disclose the claimed invention except for the limitation of gate structure disposed between the second electrodes and passivation layer and between the second electrodes and the dielectric layer. It has been held that rearranging of parts of an invention involves only routine skills in the art. *In re Japikse*, 86 USPQ 70. Thus, it would have been obvious to one having ordinary skills in the art the time the invention was made to dispose the gate structure between the second electrodes and passivation layer or between the second electrodes and the dielectric layer, since rearrangement of parts of an invention is considered within the skills of the art.

Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,064,149 to Raina and WO 98/43268 to Amey and further in view of U. S. Patent 5,894,188 to Chakvorty et al.

Raina and Amey do not disclose a tantalum structure disposed between the gate structure and second electrodes.

Chakvorty et al. disclose a cladding layer of tantalum on the first electrodes which makes good electrical contact with the overlying layer. It is further noted tantalum does not inter diffuse with aluminum.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to dispose one layer of tantalum between gate structure (additional conducting electrode for focusing) and second electrodes as separating layer making good electrical contact and preventing any inter diffusion of conducting layers.

Regarding claim 60, Raina and Amey disclose the claimed invention except for the limitation of the second dielectric layer (15) disposed over the layer of silicon nitride. It has been held that rearranging of parts of an invention involves only routine skills in the art. *In re Japikse*, 86 USPQ 70. Thus, it would have been obvious to one having ordinary skills in the art the time the invention was made to dispose the second dielectric layer disposed between the second electrodes and the silicon nitride layer.

Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of WO 98/43268 to Amey.

Regarding claim 67, Shen et al. disclose all the limitations with the exception of the second dielectric layer disposed over the plurality of second electrodes. Amey discloses a second dielectric layer 15 (page 7 lines 5-10, Fig 3(a)) completely covering the planar surface of the conductor 14 patterned for separating a plurality of electrodes.

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Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to dispose a second dielectric layer disposed on the second electrodes of Shen et al. as disclosed by Amey for separating plurality of electrodes.

Regarding claim 68, Shen et al. disclose (column 5 lines 63,64) dielectric layers typically comprise silicon dioxide.

Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. and WO 98/43268 to Amey in view of U. s. patent 5,319,279 to Watanabe et al.

Regarding claim 69 Shen et al. and Amey do not disclose an evaporated molybdenum layer sputtered between molybdenum layer and the second dielectric layer.

Watanabe et al. in relevant art of field emission cathodes disclose (column 5 lines 52-60 column 6 lines 44-53 Figs. 3A-3D) the second electrode 3 made of high melting and low work function metal as molybdenum and a molybdenum layer 8 deposited over the entire surface so as to form a conical cathode emitter in the cavity.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the second electrode and the second dielectric layer of Shen et al. and Amey as made of sputtered molybdenum layer and a layer disposed between the molybdenum layer and second dielectric layer as taught by Watanabe et al. for forming a conical emitter in the cavity.

Response to Arguments

Applicant's arguments filed June 11, 2002 have been fully considered but they are not persuasive.

In response to applicants' argument that Chakvorty et al. in combination with Shen et al. do not render the electrode structure with cladding layer disposed over the metal alloy layer obvious the Examiner respectfully disagrees. Shen et al. disclose (column 4 lines 27-30) the first electrode (conductor 20) comprising only sublayers 20a made of titanium tungsten and 20b made of aluminum. Hence it would have been obvious to one of ordinary skill in the art at the time of invention to dispose the cladding layer as taught by Chakvorty et al. on the first electrode of Shen et al. for preventing interdiffusion and providing good electrical contact.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R.

Sikha Roy
Patent Examiner
Art Unit 2879



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